JOURNALISTS NEED TO KNOW HOW TO WRITE ABOUT SCIENCE – AND WE CAN TEACH THEM

By Steve McIlwaine

Introduction

Australian journalists need to write and broadcast more about science. The view that too little science is available in news media, a constant complaint of the science lobby, is certainly supported by public opinion. Surveys in Australia have mirrored those in Britain and the US in showing repeatedly and overwhelmingly that news audiences want to hear and see more about science in their media and that they consistently rate science as more desirable than politics or sport (Metcalfe and Gascoigne 1995; Lowe 1997). Clearly, it is in the interests of journalism and news organisations to tap this underexploited resource. But journalists appear to avoid science topics and are largely unequipped to handle medical science, environmental science, or any science, in ways that do not distort, misrepresent or misunderstand the science and that do not promote a continuing feud with scientists.

Journalism and journalism education are unlikely, for their own good reasons of scepticism, to adopt the broadly uncritical acceptance of the promotion of science communication as a "motherhood statement". Journalism should – and increasingly does – see science as an important area of human activity that has no inherent precedence over other important activities. But journalism and journalism education can obviously not ignore the fact that science is playing an ever-greater role in the everyday life and concerns of news audiences. Just as journalists have seen it as their responsibility to present information and interpretation in such fields as politics, economics and the legal system, so they are becoming increasingly less able to avoid responsibility for informing about and interpreting science in its manifold forms. Indeed, Weingart (1998, p.872) pointed to a "science-media coupling," in which science inevitably becomes increasingly media-oriented. However, as Fuller (1996) argued, journalists are rarely equipped to report science adequately and accurately.

> Since most journalists are never taught to read an article in a scientific journal critically, is it any wonder that they report flawed research as definitive and narrow conclusions as sweeping? (Fuller, p 183).

Journalists themselves have recognised the growth of science awareness and their inability to keep up with this growth: Ramsey (1990), investigating continuing education for practising journalists, found demand for science training second only to ethics (2.96 on a five-point scale). Also recognising a clear and growing science-media nexus, many journalism-education institutions throughout the world – and notably the US – have for some time provided postgraduate courses in science journalism. Australia, too, has a number of postgraduate courses. Their aims match those of US universities: to train people with science backgrounds to write as specialists for the media or to train people with media-writing skills to become specialists in science writing. The aim of these courses is to provide the industry with journalists who can take on the science stories when non-specialists would be out of their depth.

As commentators such as Cowen (1984) and Kapitza (1988) and others since, such as Kingston (1999) and Roth (2000), have often argued, this appears a logical solution to the perceived problems of journalism and science. But it contains a number of fundamental flaws that become apparent under only a little scrutiny. The first is that journalism generally does not want or need science specialists, at least in Australasia. Only about 50 science and/or medical and/or environmental specialists are listed in Gee's *Media Guide* (2001) and all of these are in metropolitan newspapers, specialist magazines and the ABC. As Henningham (1995) observed, newspapers and other media generally need to be large organisations before permitting themselves the "luxury" of science specialists – or, indeed, any specialists. None of the hundreds of other news organisations lists a specialist in anything, let alone in science. As has been pointed out (McIlwaine, Green and Tanner, 2001; Henningham 1995), journalism remains for most a generalist occupation, where practitioners are required to cover a wide range of subjects or may be assigned rounds (beats) whenever a vacancy arises, without reference to any special qualification.

A second failure of this apparent solution is that the specialist science writer in a media organisation may be in some ways least suited to the task of writing about science for lay audiences. Dornan (1999) commented that the creation of a full-time science beat within a news organisation makes the writer dependent on the cooperation of the scientific community, since, unlike other reporters, the science journalist has no set forum whose affairs can be covered on a daily basis. If science is to be a ready source of material, Dornan continued, then the journalist must cultivate the trust of scientists, and this can be accomplished only by producing coverage of which scientists themselves approve. Science journalists thus become merely sympathetic translators. Even specialist science writers are concerned about this perceived role. Veteran Australian science writer Peter Pockley (1999) noted that the World Conference of Science Journalists resolved in 1999 that the style of science journalism be changed to reflect the new recognition of science's position in social structure. Pockley, a participant in the Budapest conference, writes that the science journalists "no longer wish to be seen as a cheer squad for the 'good news' of science."

A third weakness in the training of specialists is that specialists appear rarely to remain in the news media they have trained to enter. Although no reliable recent figures are available, Schoenfeld (1979) found that only a little over one-tenth of environmental-science-journalism graduates over 10 years remained in the news media. This may be for a number of reasons, but among them must be the fact that, although scientists can learn journalism, they do not necessarily become competent journalists. The late Ian Anderson, who was Australian editor of *New Scientist*, quoted an anonymous science-journalism educator's opinion that science graduates are "not terrific stylists" and who "asked the time, will tell you how a watch works" (Anderson 1989, p.70). Moyal (1973) cites the then editor of *The Age*, Melbourne, as saying: "We have tried with dismal results to turn science graduates into journalists." (p. 134). Such "not terrific" journalists or journalists who see their role as solely that of science writers may well find difficulty adjusting to a newsroom in which they are often required to succeed at a wide range of general tasks. Detjen *et al* (2000) found that designated environmental reporters in the US were spending increasingly less time writing in their designated field, with fewer than half of newspaper and radio reporters spending 50 percent or more of their time covering the environment. Only a third of designated magazine reporters and a mere 13 percent of television reporters spent that much time on environmental reporting. Saari *et al* (1998) noted that, in 1994 at least, the number of Canadian science journalists employed in the mass media was declining slightly, with only 18 full-time reporters recorded. The decline was seen as a consequence of the unsupportive structure for science writers of Canadian daily newspapers.

As has been argued elsewhere (McIlwaine 2001b), specialisation is not the answer to increasing public access to science information. Specialisation may maintain the status quo: science stories may continue to appear under specialist bylines, but specialists cannot be on hand to treat the increasing number of stories that will have a science basis, a science flavour or aspects of science that would enhance the story if noticed and developed.

A better alternative would appear to be to prepare *all* journalism students for the inevitable confrontations with science. The School of Journalism and Communication at The University of Queensland goes some way towards realising this, with a third-year elective called Science and Technology Journalism (McIlwaine, Green and Tanner, 2001). Between 10 and 18 final-year undergraduate and postgraduate students each year have completed the one-semester course since it was established in 1999. The course combines the history, philosophy and sociology of science with face-to-face encounters with scientists at work, and news and feature writing from scientific journals. The success or otherwise of this course in adding to students' preparation for generalist work is yet to be gauged. However, empirical evidence suggests students do gain substantially from the experience.

A survey of source responses to students' science news stories was carried out over two years. The survey was designed to synthesise, though not duplicate, elements of previous work by several researchers.

It is safe to assume that most journalism students do not have a background in science and are not particularly interested in science. Tobias (1995) found that liberal arts students in the United States, among them pre-journalism students, leave college with three strongly held views about science: first, they're no good at it; second, they don't like it very much; and third, that science is irrelevant to their future. Well aware of this, Uryycki and Weardon (1998) tested university journalism students' ability to write a simple, yet accurate account of a scientific journal article. They found that all students, regardless of university, performed poorly. All student-written articles were plagued with inaccuracies. Comments from a scientific panel examining the writing included "Article was hopelessly muddled", "Abysmal writing by turns incomprehensible and overly simplistic", "Several errors and distortions of fact suggest a lack of comprehension", "Very poorly written", "Unclear and confusing", "Easy to read but largely wrong", "The author does not appear to understand the distinction between scientific knowledge and other forms of knowledge" (p.75). Urycki and Weardon recommended that journalism schools require students to take science courses and develop specialised writing courses to provide students with the instruction and experience necessary to comprehend scientific journal articles and to write readable and accurate general readership versions. "Ideally, these courses would provide interested students with basic insight into the workings of science and technology," they concluded (p.76).

It comes as no great surprise that students' inability to write about scientific research reflects pretty much what has been observed in professional journalists, as Fuller (1996) observed. While debate and criticism about accuracy and journalists' comprehension of science has been constant since the 1950s (eg, Tichenor *et al*, 1970; Tankard and Ryan 1974; Pulford 1976; Borman 1978; McCall and Stocking 1982; Moore and Singletary 1985; Singer and Endreny 1993; Peters 1995; Ankney *et al* 1996; House of Lords Select Committee 2000), scientists' "horror-story" accounts abound in the literature and many of these refer to misemphasis, sensationalism and trivialisation, as well as factual error.

Throughout the debate, observers have clearly noted a distinction between specialist and non-specialist science writers (Sandler 1993; Entwistle 1995; House of Lords Select Committee 2000). While specialists are perceived to value their reputations for accuracy and to go to a deal of trouble to get the story "right", non-specialists show little in the way of such considerations. However, crucially, specialists contribute only a small fraction of the science stories published in the media (House of Lords Select Committee 2000).

Tankard and Ryan (1974), pioneers in the field of source response in science journalism, focussed on scientists' perception of accuracy in news articles for which they had been primary sources. The mean number of kinds of errors per story was 6.22, with a range of 0 to 24. Only 8.8 per cent of stories contained no errors. The authors concluded that science articles were at least four times as likely to contain errors as general news stories. Borman (1978), studying popular science magazines, found eight of 10 evaluators judged as accurate 50 per cent of science articles. Ankney *et al* (1996) examined reporting on heart surgery in 42 publications and found 52 factual errors, 127 instances of misuse of technical terms, 29 misspellings or mistakes with proper nouns and seven misquotations. The combined error rate averaged 5.12 errors a story.

Peters (1995) cited Peters and Krüger (1985) and Krüger (1987), who found that about 17 per cent of scientists who had had personal contacts with journalists reported "rather bad" experiences. Another 51 per cent reported "partly good, partly bad" experiences and only 32 per cent rated the contacts as "rather good".

Method

Although seeking approval ratings from scientists sources may contradict the new, independent stance of Pockley and the World Conference of Science Journalists (above), it was considered worthwhile to use elements of tried and tested methods of obtaining data on sources' opinions of journalistic science writing. In the current survey, after four hours of lectures, each student was given the title of a recent or current scientific journal article in the university's libraries. The four hours of lectures covered an examination of what is published in Australia on science and technology, scientific publishing, interpretation of scientific publication, and principal problems with popularisation of science. The articles had been selected for potential news values and for author proximity, almost exclusively recent research by scientists in south-east Queensland institutions. The exceptions were research work by people in more distant institutions who were known to be readily accessible by e-mail. Students were required to find and read the articles and to contact the author or authors for comment and explanation of the article. The students then wrote a news story using the article and the author's comments. [1] Students had been told that the stories would be evaluated by the sources but were instructed not to allow the sources to see the stories before they were submitted. The stories were sent to the authors for their responses on an 11-response form. Responses on a standard five-value Likert index (-2 strongly disagree, -1 disagree, 0 neutral, 1 agree, 2 strongly agree) were sought for the following:

1. The article was a fair and accurate account of the article.

2. The scientific terms in the article were accurate.

3. Personal titles and names, as well as organisation names, were accurately reported.

4. The article communicated the most important matters raised in the research.

5. The research discussed was not trivialised.

6. The research discussed was not sensationalised.

Responses of "yes" or "no" were sought for the following:

7. Have you spoken to a journalist previously about your or others' research work in your field?

8. Were you satisfied with that published article?

9. Have you spoken to a journalism student previously about your or others' research work in your field?

10. Would you be happy to discuss your or others' research work with the student journalist who wrote the enclosed article?

An open-ended opportunity to comment was provided at the end of the survey form.

Results

Q	Responses																										
1	1	1	1	1	-2	1	1	0	1	1	1	2	2	1	1	1	-1	2	0	0	0	1	1	1	1	1	1
2	2	1	1	1	1	1	1	-1	1	1	1	1	2	0	0	1	-1	1	1	-1	1	1	-1	2	1	1	1
3	2	1	2	2	1	-1	-1	-1	1	-2	2	-1	2	1	1	-1	1	1	1	1	1	1	1	2	2	2	1
4	1	1	1	1	1	1	1	1	2	1	2	1	1	1	1	1	0	2	0	0	1	1	1	2	2	1	0
5	1	1	2	2	1	1	1	1	2	1	1	1	1	1	2	2	-1	1	1	1	1	1	1	2	2	2	1
6	0	1	1	2	-2	0	1	0	2	1	1	1	2	0	1	1	0	2	-1	1	1	1	1	2	2	2	1
7	n	y	y	y	y	y	y	y	y	y	n	y	n	y	y	y	n	y	y	y	y	y	y	y	y	y	y
8	na	yn	yn	y	n	yn	n	y	y	yn	na	n	na	y	n	yn	na	y	n	y	n	n	yn	y	yn	y	yn

[1] Students' six subsequent stories were not included in the survey, since these were self-selected and did not provide ready access to the author or authors.

9	n	y	n	y	n	y	n	n	y	n	n	n	n	y	n	y	n	n	n	n	n	n	n	n	y	n	n
10	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	0	y	y	y	y	n	0	y	y	y	n	y

Twenty-seven responses were received, from 34 forms sent out, a response rate of almost 80 percent. Twenty-five respondents answered all questions; two respondents failed to answer question 10, probably because poor questionnaire design left this question on the back of the one-leaf document.

Responses, except for question 8 (and excluding question 9, which was not a value judgment), were positive overall, although individual negative responses were recorded for all Likert-scale questions except question 4 and all "yes-no" questions.

Likert-scale response means:

Question 1, 0.78; 2, 0.74; 3, 0.81; 4, 1.04; 5, 1.22; 6, 0.89. The mean of responses to all the Likert-scale questions was 0.91.

Yes-no response percentages:

Question 7, 85% positive, 15% negative; 8, >30% yes, >34% yes and no, >34% no; 9, 27% yes, 73% no; 10, 92% yes, 8% no.

Discussion

Because of the small population in this survey, no attempt was made to analyse responses by statistically comparing sub-groups. Differences in students' writing ability, as well as differences in degree of complexity of the scientific papers, combined with predictably subjective responses from sources (Dornan 1999) would not allow analysis with precision. However, the means and proportionate responses permit some tentative conclusions to be drawn.

First, the responses are all generally positive, despite some very negative individual assessments. The least positive response (0.74) to question 2 is in line with what Ankney *et al* found. Serious errors of this kind reported by sources in this survey included mistaking vitamin A for vitamin E, failing to understand the significance of statistical numbers, using words such as "prevention" in a medical story – where the research and researchers emphasised only reduced risk – and misquotations that would have had one researcher "metaphorically castrated" by his peers and which another found merely potentially embarrassing. The source least satisfied with accuracy (-2) stated that many statements in the story were "biased" and several statements were wrong. Although the literature is replete with complaints of mistakes with technical terms and ignorance of what numbers actually mean, the last two examples are of the kinds that rank even higher in the literature's records of complaints by scientists. Medical researchers maintain (rightly) that holding out false hopes to disease sufferers, even unwittingly, is a serious disservice; all researchers jealously guard their reputations. However, even taking into account that the students had the opportunity to have the research paper explained by sources, the results appear to be far less negative than those obtained by Urycki and Weardon (1998). Indeed, the only two negative scores significantly affect the mean response.

The second least positive mean response is to question 1 (0.78) and is, no doubt, strongly influenced by the reactions reflected in responses to question 2, as is the mean of responses to question 3 (0.81). Students almost always failed to record personal titles correctly, most often using “Mr” or “Ms” for “Dr” or “Professor”, or in some cases failing to connect the interviewee with the research work. They also showed a common vagueness about organisation titles. If nothing else, these three responses, when compared to subsequent responses, demonstrate that the chief difficulty students have with science stories is fundamental accuracy. Journalism educators are probably aware that such shortcomings are not confined to students’ science stories. However, even though the fundamental need for accuracy is emphasised, this aspect of science writing clearly warrants greater attention in science-journalism lectures.

The mean of 0.89 for question 6 suggests scientist sources are still uncomfortable with journalists’ concepts of news values (Zimmerman, 1999; Devlin, 1998; Schibeci *et al*, 1986; Sherburne, 1963), although the sources appeared generally to concede that the stories properly addressed the salient matters in the research work (question 4: 1.04). Entwistle (1995) found “sensationalism” was a constant theme of complaint and that it is in vain for journalists to protest that, faced with a strict word limit, they find it impossible to include all the caveats and qualifying statements in research reports without killing their story. Analysing evidence of “sensationalism”, “irrelevance” and “frivolousness” in science writing, Dornan found the complaints mostly subjective. Laurance (1998) sought to convince readers *of The Lancet* that the first rule of journalism is that what is published must be read, while Radford (1997) admitted that many scientists are now prepared to accept that the “entertainment” form of medical information in British newspapers may be the only way to put such information across to the public. However, Radford argued – again in *The Lancet* -- that scientists may be only dimly beginning to appreciate the difference between academic and journalistic publication: that, in a free market, the readers, listeners and viewers dictate the way a story is told. One typical source’s response in this survey illustrated the tentative nature of scientists’ acceptance of journalism practice.

> The article is OK in itself, but it would really depend on what target audience you were looking at. I feel it could have been put forward in a little more scientific manner without making it go over the general reader’s head. However, I am aware that this is a very fine line, and it is hard to communicate some of the ideas because of jargon.

Although the responses for sensationalism and relevance are likely to be connected in general assessments of the stories, more than grudging acceptance of the stories appears to have been given to the way the stories were written – with conventional news values in mind – and even more to the selection of those aspects of the research work that reflected those news values. This acceptance takes on a new significance when responses to questions 7-10 are examined. While 85% of sources had encountered a journalist previously, fewer than 35% reported that they were satisfied with the outcome of the encounter or encounters, a figure very much in line with those of Peters and Krüger (1985) and Krüger (1987). It could well be expected that unsatisfactory experiences with journalists would condition sources to respond negatively to further experiences, even though in this case the “journalists” were clearly students. However, more than 90% of respondents to question 10 state that they would be willing to discuss their work again with the student, indicating a very close to total level of acceptance (one of the two respondents in the negative indicated that he misunderstood the intent of this question by adding that he would be too busy).

Conclusions

Although the outcomes of this survey cannot be extrapolated directly with confidence on to the wider picture, they do indicate some areas of support for the hypothesis that journalism students, given even minimal instruction and experience, can begin to handle competently science stories from primary and secondary sources. An overall mean satisfaction rate of 0.91 does not suggest that respondents were wildly enthusiastic about the students' stories. But it does suggest that, under the circumstances, the stories were generally considered competent. This may go some way towards eroding the notion that, if science must be more widely, deeply and accurately covered, scientists trained in journalism or journalists immersed somehow in the huge mosaic of science are the only people to do it. The survey results suggest that expensive and extensive undergraduate and postgraduate programs, which may be relied on to produce specialists, are not the only way that journalism education can supply the everyday practice of journalism with people who can report on science, at least to the exacting standards of scientists. As stated earlier, graduates of these courses may even inhibit, rather than enhance, science writing's success in getting science information across to the public. This paper does not attempt to argue that a little learning is all graduates need to make them competent science writers. But it does suggest that if all journalism students were given a foundation of science writing – a one-semester course or perhaps even less – that articulated with other basic aspects of journalism, they would have a sound platform from which to approach science stories. Journalists learn about their work and their sources continually but they gain greatly from having the ground rules of this special area clearly established before they set out on careers.

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